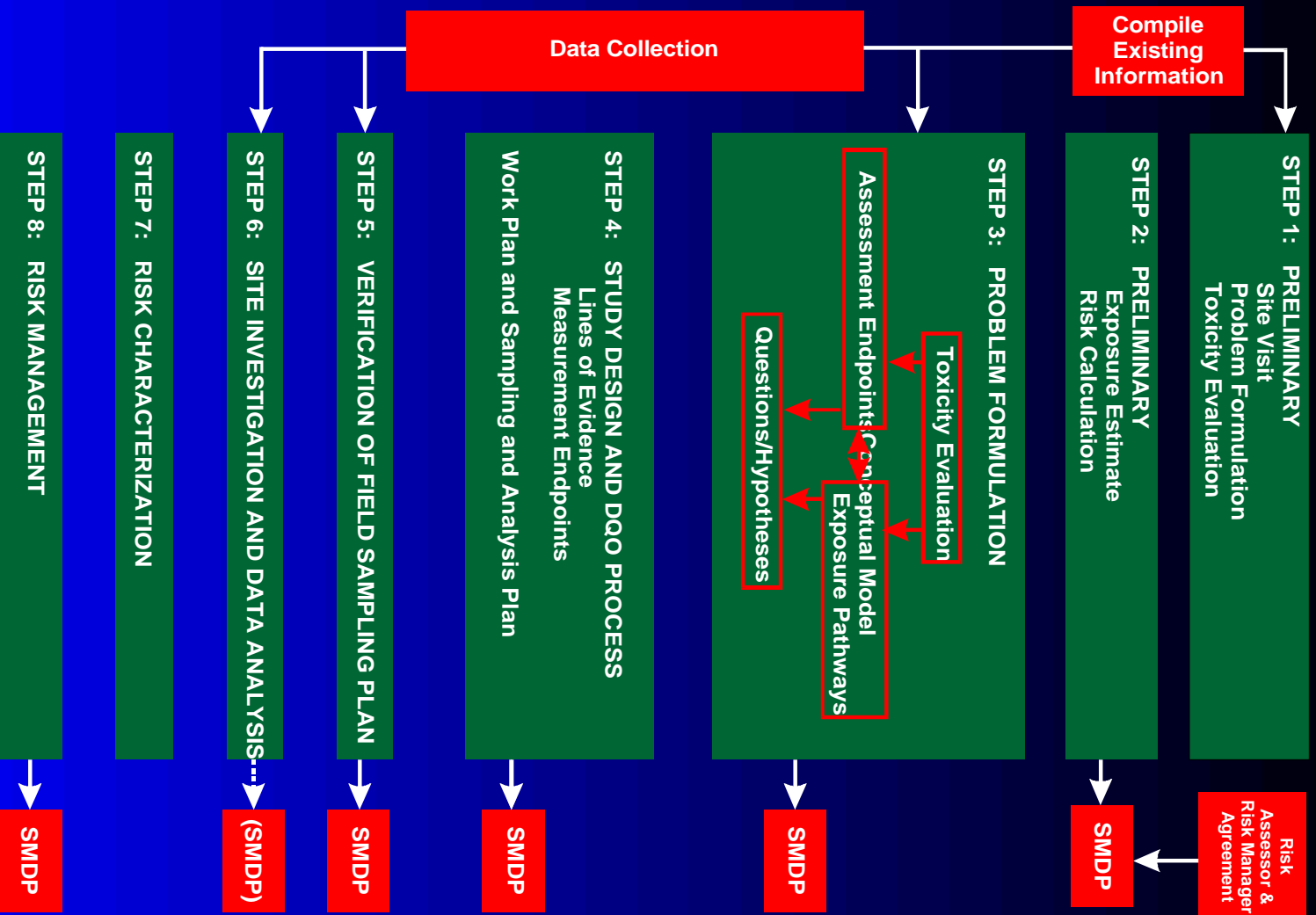


Perspective on the Process and Issues of Ecological Risk Assessment on Perchlorate

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The U.S. EPA Office of Emergency and Remedial Response (OERR), I.e. Superfund, has adopted a process for designing and conducting ecological risk assessments on chemical stressors at hazardous waste sites.



Compile Existing Information

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graph LR; A[Compile Existing Information] --> B[STEP 1: PRELIMINARY<br/>! Site Visit<br/>! Problem Formulation<br/>! Toxicity Evaluation]; A --> C[ ]; B --> D[STEP 2: PRELIMINARY<br/>! Exposure Estimate<br/>! Risk Calculation]; D --> E[SMDP]; D --> F[Risk Assessor and Risk Manager Agreement]; F --> E;
```

The diagram illustrates a two-step preliminary risk assessment process. It begins with a vertical box on the left labeled 'Compile Existing Information'. An arrow points from this box to a central box labeled 'STEP 1: PRELIMINARY', which lists three activities: '! Site Visit', '! Problem Formulation', and '! Toxicity Evaluation'. From the bottom of the 'STEP 1' box, an arrow points down to another central box labeled 'STEP 2: PRELIMINARY', which lists '! Exposure Estimate' and '! Risk Calculation'. From the bottom of the 'STEP 2' box, an arrow points to a box on the right labeled 'SMDP'. Additionally, an arrow points from the bottom of the 'STEP 2' box to a vertical box on the right labeled 'Risk Assessor and Risk Manager Agreement', which then points down to the 'SMDP' box. A separate arrow points downwards from the 'Compile Existing Information' box.

STEP 1: PRELIMINARY

- ! Site Visit**
- ! Problem Formulation**
- ! Toxicity Evaluation**

STEP 2: PRELIMINARY

- ! Exposure Estimate**
- ! Risk Calculation**

**Risk Assessor and Risk
Manager Agreement**

SMDP

STEP 3: PROBLEM FORMULATION

Toxicity Evaluation

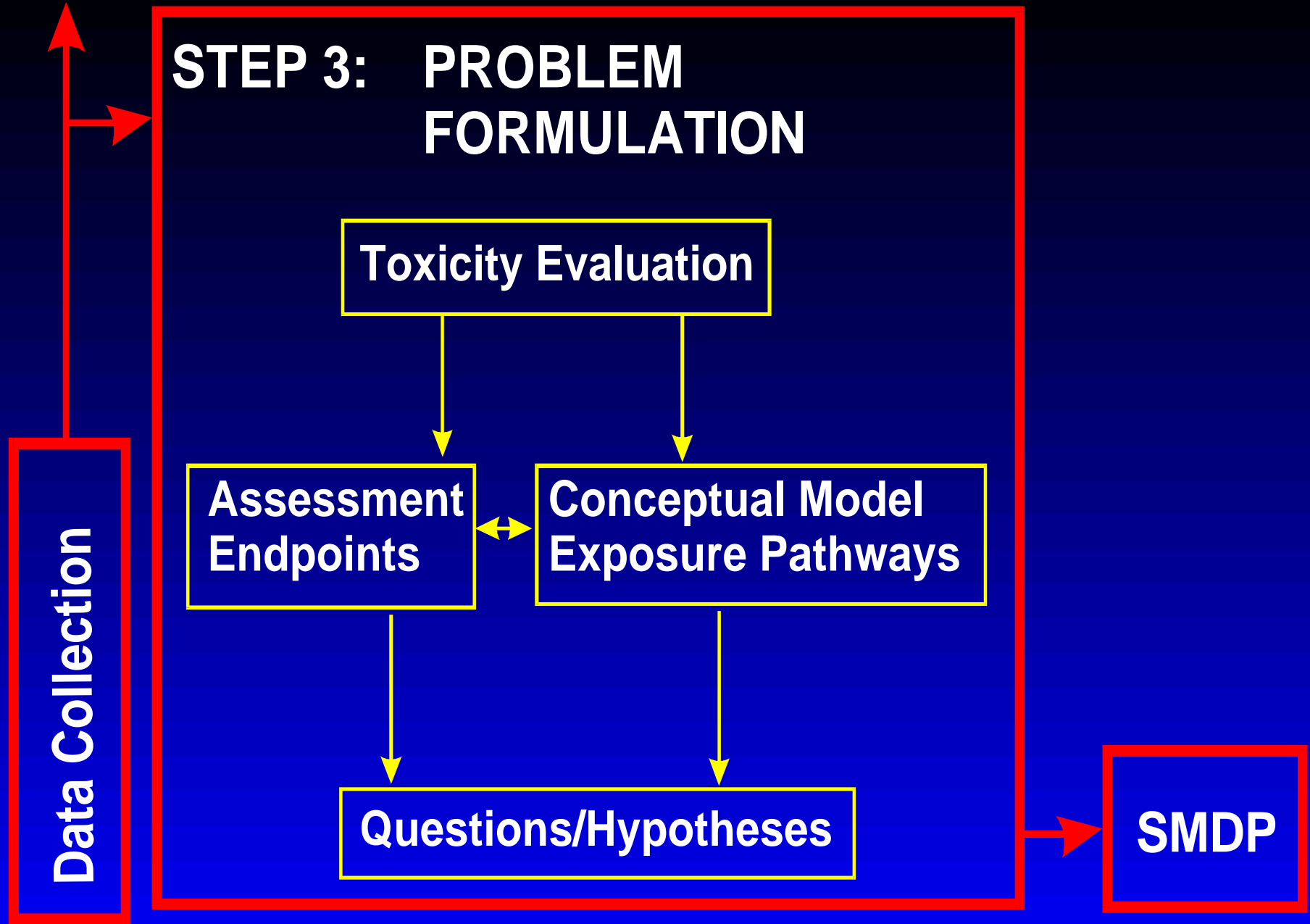
Assessment
Endpoints

Conceptual Model
Exposure Pathways

Questions/Hypotheses

Data Collection

SMDP



STEP 4: STUDY DESIGN AND DQO PROCESS

- ! Lines of Evidence**
- ! Measurement Endpoints**

**Work Plan and
Sampling Analysis Plan**

SMDP



```
graph LR; A[STEP 4: STUDY DESIGN AND DQO PROCESS  
! Lines of Evidence  
! Measurement Endpoints  
Work Plan and Sampling Analysis Plan] --> B[SMDP]
```



```
graph LR; C[STEP 5: VERIFICATION OF FIELD SAMPLING PLAN] --> D[SMDP]; E[ ] --> C;
```

STEP 5: VERIFICATION OF FIELD SAMPLING PLAN

SMDP

```
graph LR; Step6[STEP 6: SITE INVESTIGATION AND DATA ANALYSIS] -.-> SMDP1[SMDP]; Step7[STEP 7: RISK CHARACTERIZATION]; Step8[STEP 8: RISK MANAGEMENT] --> SMDP2[SMDP];
```

**STEP 6: SITE INVESTIGATION
AND DATA ANALYSIS**

SMDP

**STEP 7: RISK
CHARACTERIZATION**

STEP 8: RISK MANAGEMENT

SMDP

The heart of an ecological risk assessment is problem formulation. An effective problem formulation depends upon knowledge of contaminant fate and transport and either mechanism of toxicity and/or sensitive species

We know perchlorates:

- can affect mammalian and amphibian thyroid functioning**
- can affect fish at high water concentrations**
- can affect freshwater invertebrates at high water concentrations**
- can affect plants**

However, mechanism of toxicity is unknown

Outstanding issues which are needed to do a comprehensive problem formulation include:

- further understanding of environmental fate and transport of perchlorate at low levels in environmental settings
- knowledge of perchlorate bioaccumulation potential and possible sequestering within organisms
- knowledge of possible toxicity mechanisms other than thyroid functioning
- evaluation of exposure mechanisms for ecological receptors

What are the current sources of additional information?

- Analytical Techniques
 - limit the ability to evaluate bioaccumulation
 - limit the ability to evaluate sequestering in organisms
 - limit ability to evaluate exposure
- Use of high exposure toxicity tests at low exposure toxicity

In Conclusion:

- The current approach to developing data on the ecological risks from perchlorate have conceptually followed Superfund's ecological risk assessment process.
- Because of the substantial knowledge and analytical limitations which currently exist, careful planning and a diligent problem formulation are critical to the successful evaluation of any potential ecological risk from perchlorate.